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PATENT SPECIFICATION (11) 1 499 863

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(19)

(54) PIPE JOINT

(71) We, CIBA-GEIGY AG, a Swiss Body Corporate, of Basle, Switzerland, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to pipe joints and is more particularly directed to means suitable for joining pipe sections which are unduly heavy and/or difficult to seal to one another because of conditions in the field.

When laying pipe in a ditch, the bottom of the ditch is never truly level or straight. A ditch will follow the terrain, and the terrain is rarely level but rises and falls. Thus, when joining pipe sections, a measure of flexibility at the joints is highly desirable without losing the sealing properties of the joints.

Moreover, when laying and connecting pipe sections of large diameter and of substantial weight, it is difficult to rotate the pipe sections in order to connect them to one another.

In an endeavour to overcome the problems outlined above, we provide a pipe joint comprising a first pipe section, a first sleeve surrounding and bonded to one end of the first pipe section, a second sleeve on the first pipe section rearward of the first sleeve, the second sleeve being externally screw threaded and having an internal diameter greater than the outer diameter of the first pipe section, an elastomeric spacer ring surrounding the first pipe section intermediate the sleeves, the first sleeve and spacer ring preventing removal of the second sleeve from said one end of the first pipe section, a second pipe section, and a collar bonded to and extending from an end of the second pipe section, the collar having an internally screw threaded portion adjacent the forward end thereof for engagement with said externally screw threaded second sleeve, the collar having a second portion rearward of the internally screw threaded portion adapted to receive the portion of the first pipe section having said first sleeve and spacer ring thereon, the second portion having an internal annular groove, and a sealing ring in the groove for engagement by a portion of said first sleeve; the outside of the first sleeve and the inside of said second portion of the collar being shaped to allow axial misalignment of said pipe sections whilst said first sleeve remains in engagement with the sealing ring when the pipe sections are coupled together.

Throughout misalignment of the pipe sections permitted by the joint construction, the sleeve bonded to said first pipe section remains in engagement with the sealing ring within the collar bonded to the second pipe section so that the seal between the parts remains effective.

In the accompanying drawings:—

FIGURE 1 is a longitudinal, cross-sectional view showing the ends of a pair of pipe sections provided with joining means prior to the connection of the pipe sections to one another;

FIGURE 2 is a view similar to Figure 1 except that the pipe sections are shown joined to one another;

FIGURE 3 is a partial view showing the relationship of the sleeve portion on one pipe section with respect to the adjoining collar portion on the other pipe section when the pipe sections are joined and in one extreme position of misalignment;

FIGURE 4 is a view similar to Figure 3 showing the parts in another position of misalignment; and

FIGURE 5 is an enlarged view showing a cross section of the pipe wall.

Referring to Figures 1 and 2, a joint is provided for the connection of the pipe sections A and B. Preferably the pipe sections are made of glass filaments coated or impregnated with a thermosetting resin, such as epoxy resin and a suitable hardener, a polyester resin or the like. The pipe may be made continuously and cut into sections of predetermined length, as disclosed in U.S. Patent Specification No. 3,507,412. Preferably, the pipe sections are made with a resin liner or inner skin 6 and an outer resin skin 7 with an intermediate layer 8 of

resin-impregnated glass filaments, as shown in Figure 5.

A first sleeve C is positioned upon and bonded to the end of the pipe section A. Prior to securing the sleeve C to the pipe section, a second sleeve D and a spacer ring E of elastomeric material, are slipped onto the pipe section. The ring may be made of rubber, neoprene or any other suitable elastomeric material. The sleeve D has an external screw thread 10 and has an internal diameter 12 which is greater than the outer diameter of the underlying portion of the pipe section A. The elastomeric spacer ring E surrounds the pipe section intermediate the sleeves C and D. The spacer ring has an internal diameter slightly larger than the outer diameter of the pipe. The presence of the sleeve C bonded to the forward or leading end of the pipe section prevents removal of the spacer ring and of the loose-fitting, externally screw threaded sleeve D. The forward or front sleeve C is bonded to the end of the pipe by a suitable thermosetting resin adhesive. The pipe section is ground to provide a bevel or chamfer 14. The bevel extends from the intermediate layer 8 to the outer skin 7 so that the adjoining inner surface of the sleeve C may be bonded to the intermediate layer 8 and resin skin 7 by a similar thermosetting resin. The forward edge or nose 16 of the sleeve C extends beyond or forward of the forward edge 18 of the pipe section A.

The sleeves C and D are preferably made of a glass fiber reinforced thermosetting resin, and preferably they are formed by centrifugal casting. The sleeves may be cast as a single sleeve and then cut to furnish the two pieces as shown. Also, the internal surface of each sleeve may have a taper which has an internal diameter which increases slightly toward the right as viewed in Figures 1 and 2.

Pipe section B has a collar F bonded to and extending from an end thereof. The collar F may be separately made in the manner disclosed in U.S. Patent Specification No. 3,784,239, and bonded by a suitable thermosetting resin adhesive to the pipe section B. As described with regard to the pipe section A and the sleeve C, the pipe section B is provided with a bevel 17 and the inner surface of the collar is bonded to resin surface provided by the skin 7 as well as to the intermediate layer 8 having glass fibers therein. It is preferred to form the collar directly on the pipe section. This is done by providing a former within the end of the pipe section, the former extending therefrom, winding continuous glass filaments coated or impregnated with a thermosetting resin composition onto the pipe section and former, then curing the resin of the filament wound collar, and removing the former. The former may be of the collapsible type or of a deformable or meltable material, such as low-melting point alloy or a eutectic mixture of inorganic salts. Such alloy or mixture will, of course, have a melting point higher than the curing temperature for the resin.

The collar F has an internally screw threaded portion 20 adjacent the forward end 22 of the collar for screw threaded engagement with the externally screw threaded sleeve D. The collar has a second portion 24 rearward of the screw threaded portion 20. The portion 24 is adapted to receive the portion of the pipe section A having the sleeve C and the spacer ring E thereon, as shown in Figure 2. The bore of the second portion 24 has an annular groove 26 in its wall and a sealing ring 28 is positioned in the groove for engagement with the sleeve C. The collar is also provided with an internal annular shoulder 30 adapted to act as a stop for the pipe section A when the shoulder is engaged by the edge 16 of the sleeve C.

A significant aspect of the invention is the provision of means for connecting the pipe sections so as to permit a predetermined angular misalignment of adjoining pipe sections to thereby furnish a measure of flexibility of the joint. Also, the pipe sections are self-aligning at the joint. This is accomplished without sacrifice of the seal provided by the engagement of the sleeve C at its external surface with the O-ring 28. A portion of the sleeve C is tapered towards the forward edge 18 and the internal surface 32 of the portion 24 of the collar increases in diameter towards the forward end 22 so that when the pipe sections are connected, a predetermined amount of misalignment can be accommodated with the sleeve remaining in engagement with the sealing ring.

In greater detail, the sleeve C has a first and a second portion, the second portion 34 tapering toward the front end 16 of the sleeve from a position approximately midway of the length of the sleeve C at 35. The taper of the first portion of sleeve C may be less pronounced than that of the second portion in the area 38 which continues to the rear end 36 of the sleeve C. The internal surface 32 of the portion 24 of the collar has a taper which widens or which increases in diameter from the shoulder 30 toward the open end 22 of the collar. The taper on the internal surface 32 of the collar provides a gap between the area 38 of the sleeve C and the surface 32 of the collar. The collar is provided with an internal tapered surface 39 which widens or increases in diameter from the shoulder 30 toward the end 37 of the collar which is opposite the end 22. Thus, the difference between the angles of taper of the outside surface of sleeve C and the

internal surface 32 of the collar provides, when the pipe sections are connected, an angle of clearance *a* on each side of the area of engagement of the sealing ring 28 and the sleeve C, as shown in Figure 2. The angle *a* is preferably approximately two degrees and in consequence the maximum angle of misalignment or angle *b*, as shown in Figures 3 and 4, is twice the angle of clearance, or approximately four degrees.

The permitted axial misalignment of the pipe sections is not accommodated by reason of large tolerances between the sections. The O-ring 28 is positioned within the collar so that it seals with the juncture of the outside surfaces of the first and second portions of the sleeve C and does not come away from the groove 26 when one pipe section moves with respect to the other pipe section. Also, when the pipe sections are installed and settle, the O-ring has the same amount of compression throughout the permitted angular misalignment of the adjoining pipe sections. The O-ring which is wedged between the adjoining pipe sections, is in compression when the sleeve C on the pipe section A is inserted in the collar on pipe section B, and the O-ring is maintained in compression as long as the sleeve D is screwed all the way into the collar F. In addition, side loads on the pipe sections are absorbed at the sealing area.

The spacer ring E cushions any axial load which is transmitted from the sleeve C to the sleeve D. The resiliency of the elastomeric spacer ring contributes to the amount of misalignment which can be permitted between the pipe sections. Also, the load is distributed along the line of bonding or the adhesive line between the sleeve C and the underlying pipe section.

To facilitate rotation of the sleeve D it may be provided with spaced ribs 40 at the end opposite the end adjacent the spacer ring. The ribs are cooperable with a tool for rotating the sleeve.

WHAT WE CLAIM IS:—

1. A pipe joint comprising a first pipe section, a first sleeve surrounding and bonded to one end of the first pipe section, a second sleeve on the first pipe section rearward of the first sleeve, the second sleeve being externally screw threaded and having an internal diameter greater than the outer diameter of the first pipe section, an elastomeric spacer ring surrounding the first pipe section intermediate the sleeves, the first sleeve and spacer ring preventing removal of the second sleeve from said one end of the first pipe section, a second pipe section, and a collar bonded to and extending from an end of the second pipe section, the collar having an internally screw threaded portion adjacent the forward end thereof for engagement with said externally screw threaded second sleeve, the collar having a second portion rearward of the internally screw threaded portion adapted to receive the portion of the first pipe section having said first sleeve and spacer ring thereon, the second portion having an internal annular groove, and a sealing ring in the groove for engagement by a portion of said first sleeve; the outside of the first sleeve and the inside of the said second portion of the collar being shaped to allow axial misalignment of said pipe sections whilst said first sleeve remains in engagement with the sealing ring when the pipe sections are coupled together.

2. A pipe joint according to Claim 1, wherein the outside of the first sleeve narrows toward the one end of the first pipe section and the inside of the second portion of the collar widens toward the internally screw-threaded portion of the collar.

3. A pipe joint according to Claim 1 or Claim 2, wherein the pipe sections can be misaligned by up to four degrees when the pipe sections are coupled together.

4. A pipe joint according to Claim 1, 2 or 3, wherein circumferentially spaced ribs are provided on that end of the second sleeve remote from the end adjacent the spacer ring.

5. A pipe joint according to Claim 1, wherein said first sleeve has a first portion and a second portion which tapers toward that end of the first pipe section to which the first sleeve is bonded and the inside of said second portion of the collar widens toward the internally screw threaded portion of the collar, the annular groove being positioned in said second portion of the collar so that when the pipe sections are coupled together the sealing ring engages with the juncture of the outside surfaces of the first and second portions of the first sleeve thereby permitting axial misalignment of the pipe sections.

6. A pipe joint according to Claim 5 wherein the permitted angle of axial misalignment is approximately four degrees.

7. A pipe joint substantially as described herein with reference to the accompanying drawings.

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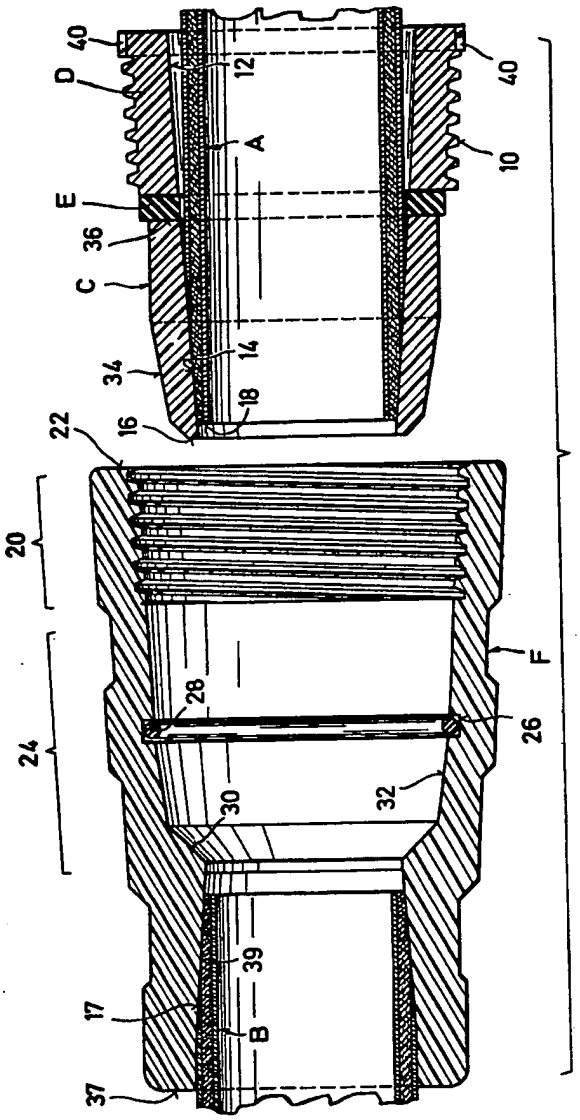

Fig. 1

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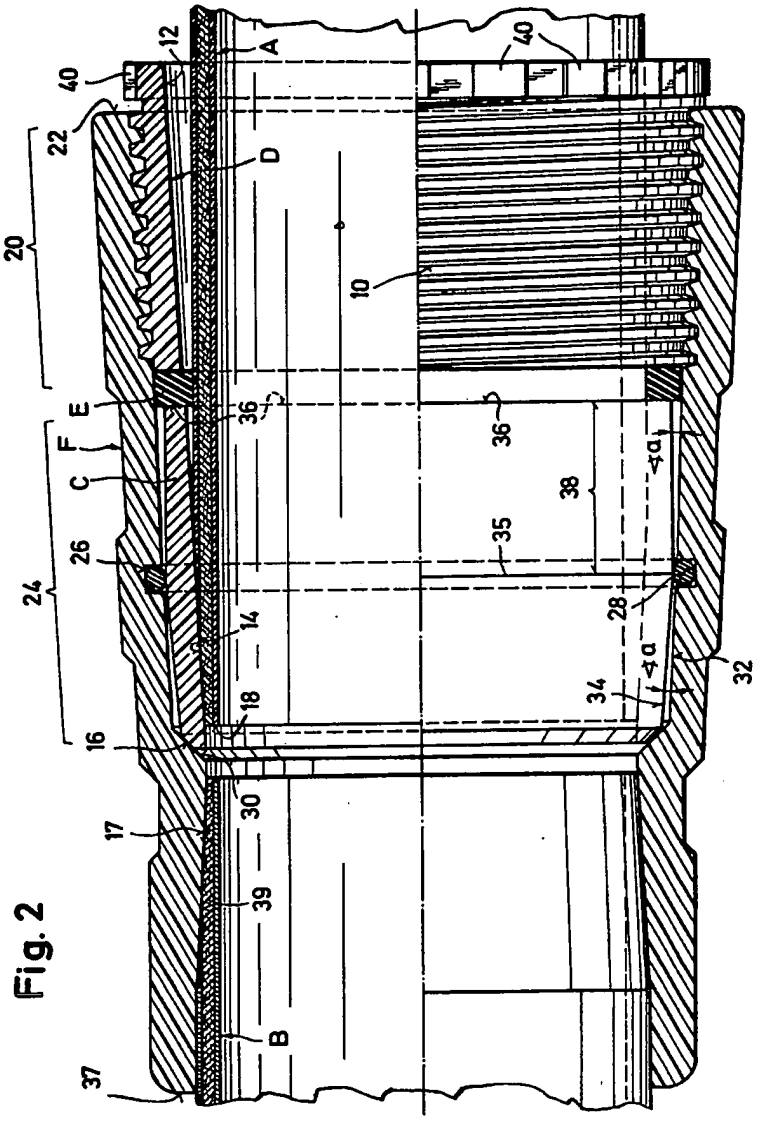

Fig. 2

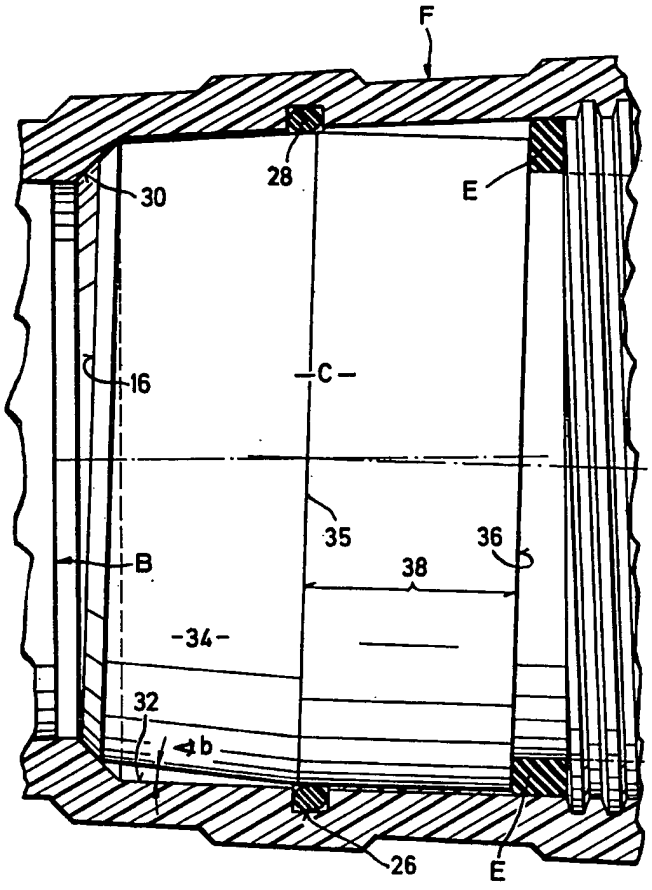

Fig. 3

1499863 COMPLETE SPECIFICATION
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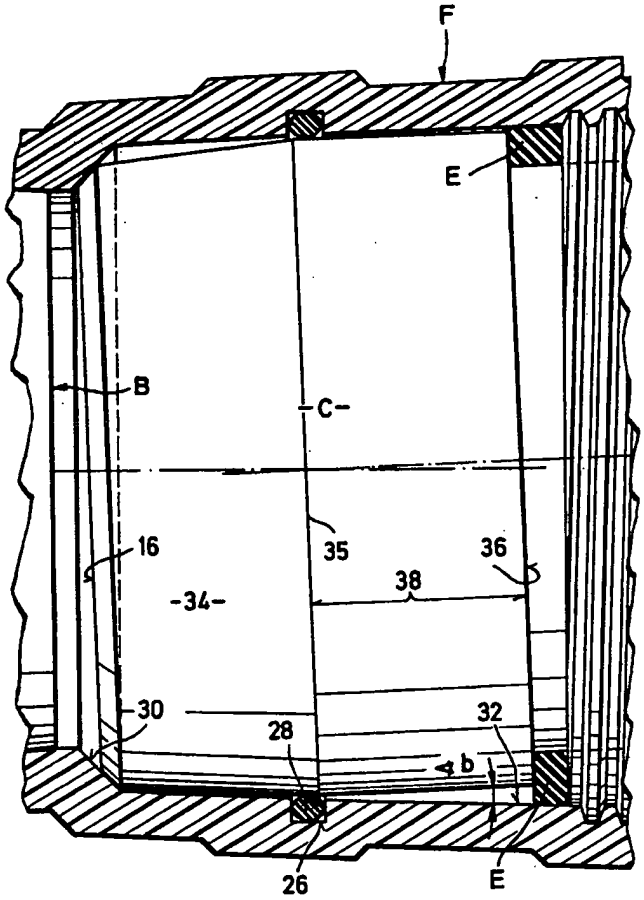

Fig. 4

Fig. 5